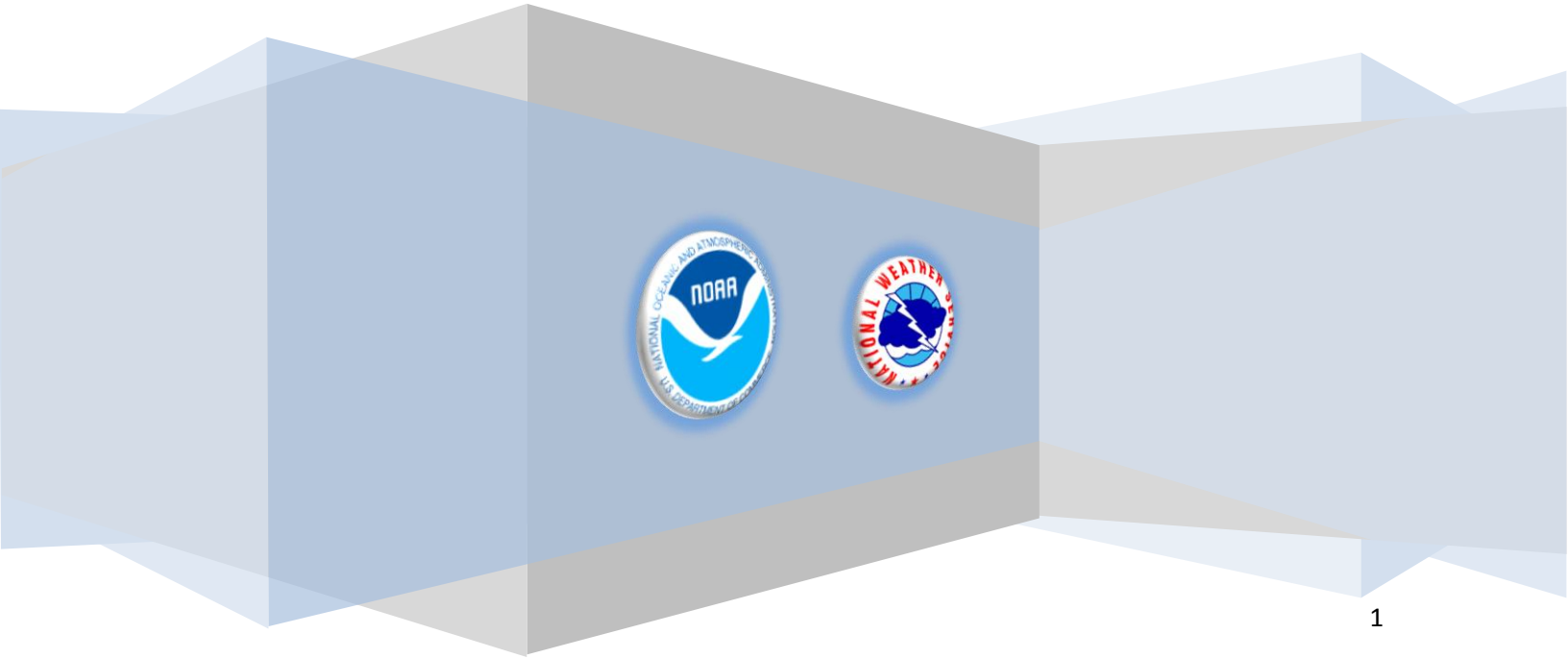
Natural Hazards Assessment

Mower County, MN

Prepared by: NOAA / National Weather Service La Crosse, WI



Natural Hazards Assessment
for
Mower County, MN

Prepared by NOAA / National Weather Service – La Crosse
Last Update: November 2010

Table of Contents:

Natural Hazards Assessment
Mower County, MN

Prepared by National Weather Service – La Crosse

Overview

Mower County is in the Upper Mississippi River Valley of the Midwest with rolling hills and relatively flat farm land. The City of Austin is an urban area on the far western end of the county.

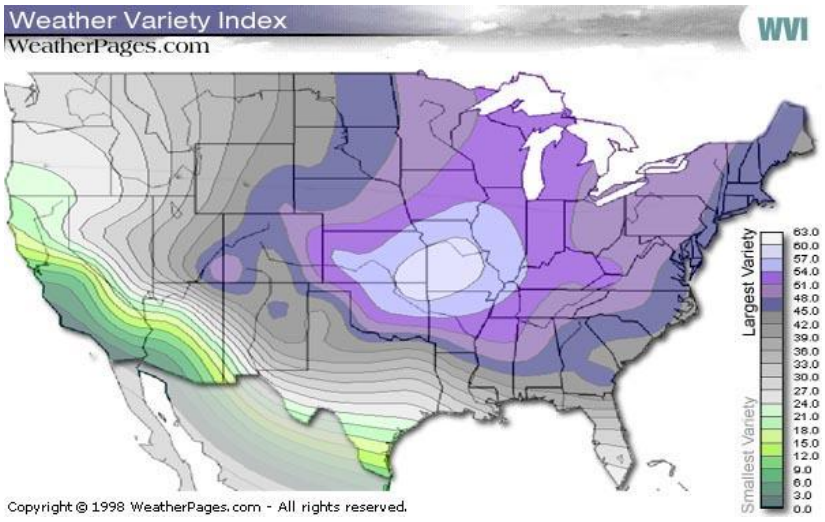
The area experiences a temperate climate with both warm and cold season extremes.

Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 4 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

Thunderstorms occur on average 30 to 50 times a year, mainly in the spring and summer months. The strongest storms can produce associated severe weather like tornadoes, large hail, or damaging wind. Both river flooding and flash flooding can occur, along with urban-related flood problems. Heat and high humidity is occasionally observed in June, July, or August.

The autumn season usually has the quietest weather. Dense fog occurs several times during mainly the fall or winter months. High wind events can also occur from time to time, usually in the spring or fall.

The variability in weather can be seen in the following graphic, created by a private company (weatherpages.com) that rated each city on variations in temperature, precipitation, and other factors. Rochester, MN ranked 3rd highest in variability out of 277 cities.

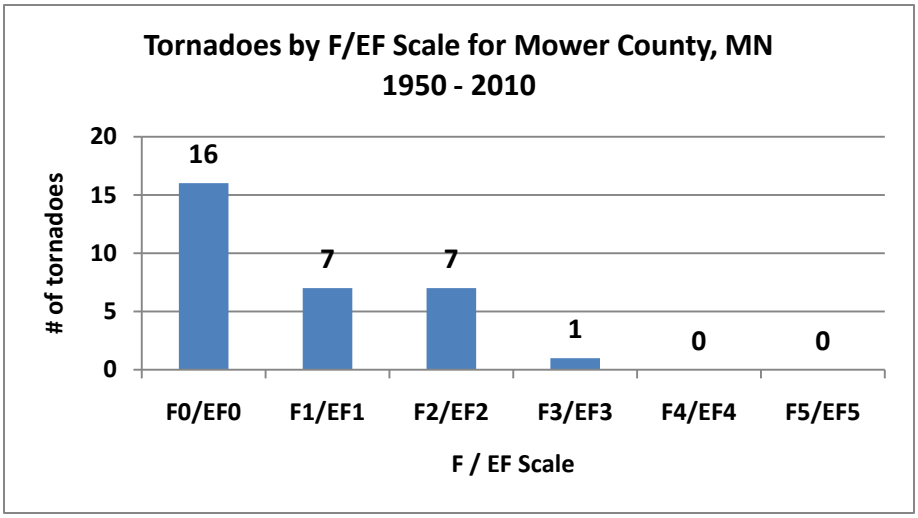


Since 1998, Mower County has been included in a FEMA Federal Disaster Declaration 6 times:

1998 – Severe storms
2000 – Severe storms / flooding
2001 – Flooding
2004 – Severe storms / flooding
2008 – Severe storms / flooding
2010 – Severe storms / flooding

Tornadoes

Even though Minnesota averages about 24 tornadoes per year, Mower County has only had 31 tornadoes since 1950, averaging about one tornado every 1-2 years. Most tornadoes are short-lived and small. May and June are the peak months and most occur between 3 and 9 p.m., but they can occur nearly any time of year and at all times of the day.



Most recent tornadoes:

- June 17, 2009 (EF2)
- Aug. 18, 2005 (F0)
- Mar. 30, 2005 (F0)
- June 16, 2004 (F0)
- June 11, 2004 (F0)
- June 11, 2004 (F3)
- May 1, 2001 (F0)
- May 1, 2001 (F1)
- July 27, 1995 (F2)
- Apr.18, 1995 (F0)
- June 8, 1993 (F0)
- July 7, 1991 (F1)

On June 11, 2004, a strong tornado (F3) that also hit Riceville, IA moved north and crossed the state line near Le Roy, MN completely demolishing several homes and farms. The tornado dissipated just north of Le Roy, but there were other brief touchdowns that day in the county. In May 2001, another strong tornado that hit Glenville, MN tracked towards the northwest side of Austin damaging several nearby homes. And more recently, a tornado hit the north and east sides of Austin in June 2009 that hit Todd Park, damaged some homes, and injured one.

Strongest tornadoes: (1850-2010)

- Aug.20, 1928 (F4) – 60 inj, 5 dead
- June 10, 1897 (F4) – 22 inj, 1 dead
- Sept.21, 1894 (F4) –70 inj, 16 dead
- June 13, 1930 (F4) – 0 inj, 1 dead
- June 11, 2004 (F3) – 2 inj, 0 dead

Mower County Tornado Facts:

- No F5 or EF5 tornadoes
- Last violent tornado - 1930
- 23 deaths and 167 injuries since 1850
- Tornadoes have occurred March – September
- Most have occurred in June (15)

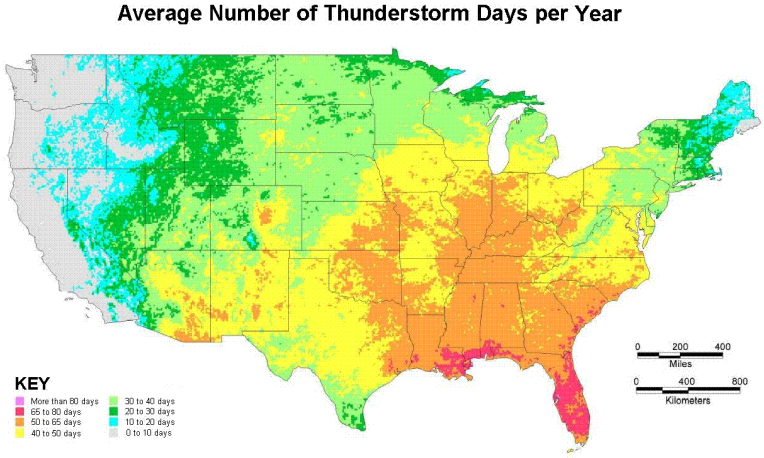
Tornado Watches		Tornado Warnings	
Year		Year	
2010	5	2010	1
2009	3	2009	2
2008	7	2008	5
2007	7	2007	0
2006	6	2006	0
2005	10	2005	1
2004	13	2004	2
2003	7	2003	0
2002	6	2002	1
2001	6	2001	2

Enhanced Fujita (EF*) Scale	
EF0	65-85 mph
EF1	86-110 mph
EF2	111-135 mph
EF3	136-165 mph
EF4	166-200 mph
EF5	>200 mph

* Started February 1, 2007

Severe Thunderstorms / Lightning

Mower County averages 39 thunderstorm days per year. The National Weather Service (NWS) considers a thunderstorm severe when it produces wind gusts of 58 mph (50 knots) or higher, 1 inch diameter hail or larger, or a tornado.



Downdraft winds from a severe thunderstorm can produce local or widespread damage, even tornado-like damage if strong enough. Most severe thunderstorm winds occur in June or July and between the hours of 4 and 8 p.m., but can occur at other times. Most damage involves blown down trees, power lines, and damage to weaker structures (i.e. barns, outbuildings, garages) with occasional related injuries. In 1998, a large squall line moved through the region with wind gusts in excess of 100 mph knocking down hundreds of trees and damaging buildings. Planes were flipped over at the Austin airport and power lines were down in the city. There have been 107 damaging wind reports since 1956 and 58 reports since 1995 in the county.

Large hail can also occur in a severe thunderstorm. May and June are the peak months with the most common time between 1 and 9 p.m., but it can occur in other warm season months and at any time of day. Hail is typically a crop damaging hazard but can damage roofs, windows, and vehicles if large enough (> 1"). Expenses can be high. Injuries or fatalities are rare for hail. In May 2000 and June 2009, golf ball size hail fell in the Austin and Le Roy areaa. There have been 106 large hail (≥ 3/4") reports in the county since 1956 and 70 reports since 1995.

Non-severe thunderstorms still pose a lightning risk. According to the Vaisala Group, an average of nearly 400,000 cloud-to-ground strikes hit Minnesota each year based on data from 1996 to 2005. Nationally, Minnesota ranks 28th in lightning related fatalities with 62 deaths since 1959. There was a lightning fatality in Minnesota in 2007 and two in 2009.

Severe Thunderstorm Watches		Severe Thunderstorm Warnings	
Year		Year	
2010	12	2010	13
2009	8	2009	4
2008	12	2008	16
2007	15	2007	10
2006	12	2006	10
2005	18	2005	2
2004	18	2004	8
2003	12	2003	7
2002	21	2002	4
2001	10	2001	8

Flooding and Hydrologic Concerns

On occasion intense, heavy rain producing thunderstorms or consecutive thunderstorms ("training") can bring excessive rainfall leading to flash flooding in Mower County. The relatively flat terrain usually leads to "ponding" of water but in extreme cases erosion can occur. Intense rainfall rates also lead to occasional urban street flooding, especially in/around the city of Austin.

Flooding is one of the leading killers in the United States with an annual average of 99 fatalities from 1977 to 2006. June is the most common month for flash floods, but they can occur from May through September. They are most common in the evening hours, between 8-10 p.m., but can occur at other times and typically last from 3-6 hours.

The main river basin that can impact Mower County is the Cedar River, although the headwaters of the Root River also begin in the area. There are numerous other creeks and watersheds as well. Flooding can occur from spring snowmelt and area rain, although many of the worst floods have occurred from heavy rain scenarios.

Flash Flood Warnings	
Year	
2010	1
2009	0
2008	4
2007	1
2006	1
2005	0
2004	6
2003	0
2002	1
2001	3

Cedar River @ Austin, MN Top 5 Crests (FS: 15 feet)	
Date	Crest
9/16/2004	25.00'
7/10/2000	23.40'
6/12/2008	22.40'
7/17/1978	21.90'
8/15/1993	21.30'

In mid September 2004, record setting rainfall (near 12" around Blooming Prairie, MN) led to significant and widespread flooding along the Cedar River basin. Although flash flooding was the initial problem, many of the regional rivers and creeks saw dramatic rises. The Austin, MN area saw very high to record crest levels on the Cedar River and creeks leading into it. Sand bagging efforts were used although a 20-year old man drowned when trying to cross swollen flood waters on foot. (Photos below: Flooding in Austin, MN – September 2004 – Courtesy of SMIG.NET)

In June 2008, rainfall amounts of 6-8 inches fell across the region and led to more flooding. People were rescued from submerged vehicles and sections of Interstate 90 were closed. Area creeks and rivers crested at the 2nd or 3rd highest levels on record. (Photo right)

Winter Storms and Extreme Cold

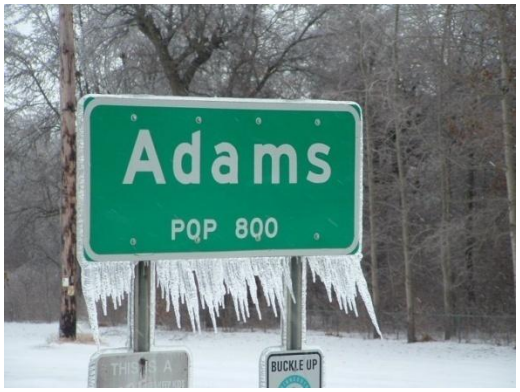
Hazardous winter weather can bring a variety of conditions to Mower County. Since 1982, an average of 4-5 winter storms impact the area each season. The relatively flat terrain does lead to blizzard or near-blizzard conditions more frequently than counties to the east, with about 8 blizzards documented since 1961. Heavy snow, sleet, and periods of blowing/drifting snow all occur.

The 30-year average seasonal snowfall at Austin is 41.1 inches with a record of 76.2 inches set during the 1961-62 winter. Grand Meadow, MN had a record 90.7 inches of snow during the winter of 1908-09. The bulk of snow falls between December and March. The largest winter storms tend to form over the central or southern Plains, then move northeast towards the western Great Lakes.

Ice storms (1/4" of ice or more) can occur but are relatively rare with only 7 occurrences since 1993.

Top 5 Seasonal Snowfalls in Austin	
Years	Snowfall
1961-62	76.2"
2006-07	70.5"
1950-51	70.3"
1951-52	64.8"
2000-01	61.1"

On February 23-25, 2007, a major winter storm impacted southeast Minnesota. The combination of heavy snow, sleet, and significant blowing and drifting over the weekend paralyzed much of the region. Ice accumulation was nearly 2" in places, especially around Adams, MN where numerous power poles and trees were knocked down. Blizzard conditions also developed leading to 4-5 foot snow drifts. Another storm hit less than a week later with another 13" of snow, setting a record for the snowiest week on record (31.0" ending 3/2/07) at Austin.



In February 2008, an accident on Interstate 90 injured six people and killed a 5-month old when white-out conditions developed.

March can often be a snowy month. Even though snowfall may be less frequent, heavy wet snow can form from large spring storms. In mid March 2005, a late season dumped about 17.5" at Grand Meadow and 17.0" in the Austin area.

Arctic cold outbreaks can occur in the upper Midwest as well. Snow depth can modify these cold temperatures leading to sub-zero readings on average 30 times a winter. Occasionally strong northwest winds will combine with arctic outbreaks to create dangerous wind chill conditions as well. The coldest temperatures are usually in January and February with average lows in the single digits and record lows colder than -30°F most days. The all-time record low is -42°F set in 1963.

Coldest Lows at Austin, MN	
Low	Date
-42°F	1/15/1963
-36°F	1/30/1951
-35°F	1/21/1970
-35°F	1/18/1970
-34°F	2/2/1996

In 1996, Austin went 6 consecutive days with temperatures at or below zero degrees (F) following a blizzard about a week earlier. Low temperatures of -24°F, -28°F, -28°F, -34°F, -31°F, and -25°F were set on six straight mornings.

The La Crosse National Weather Service issues Wind Chill Advisories when wind chill readings of -20°F to -34°F are expected. Wind Chill Warnings are issued when wind chill values at or below -35°F are expected or occurring. In January 2009, wind chill values hit -58°F in the county.

Heat, Drought, and Wildfires

On occasion the weather pattern across the upper Midwest favors prolonged heat and humidity, leading to heat waves. June through August are the warmest months with average high temperatures around 80°F and record highs above 100°F most days. The warmest temperatures on record in the county include 102°F at Austin and 107°F at Grand Meadow, MN.

Warmest Highs at Austin, MN	
High	Date
102°F	7/24/1940
100°F	6/21/1988
99°F	7/3/1990
99°F	7/31/1955
99°F	8/23/1948

In Mower County, there have been 5 heat waves since 1993. During that same time period, there were 15 fatalities directly related to heat waves in Minnesota.

One of the longest heat waves on record occurred in July 1936 when southeast Minnesota hit 90°F or higher on 14 consecutive days, including 9 days at or above 100°F and an all-time record of high of 107°F. In July 1940 temperatures also hovered around 100°F for 9 days in a row.

In more recent years, heat waves occurred in 1988, July 1995, and July/August of 2001.

Prolonged dry spells can also lead to drought causing extreme damage to crops. Droughts vary in length and intensity but abnormally dry to moderate drought conditions can occur quite frequently. Severe to extreme droughts occur far less frequently.

Droughts have occurred in Minnesota as recently as 1999, 2000, and 2006 through 2008.

Dry weather can also lead to a wildfire threat, especially in the spring before foliage has emerged (i.e. before green up) or in the fall after vegetation has started to die off. Warm, dry (i.e. lower relative humidities), and windy conditions all favor higher fire danger and can lead to sporadic grass fires in Mower County. Thick, wooded areas also pose a threat for wildfires under extremely dry conditions but occur far less frequently.

Local Climatology

Here are some basic climatology figures for the Mower County area. Data is valid for Austin, MN based on normals from a 30-year period (1971-2000).

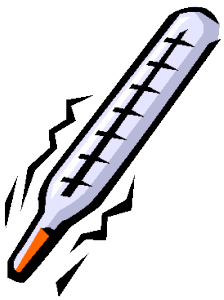
Month	Normal Maximum Temperature	Normal Minimum Temperature	Average Temperature	Precipitation	Snowfall
JAN	22.1	4.0	13.0	0.89"	11.6"
FEB	28.5	10.9	19.7	0.51"	6.3"
MAR	40.9	24.0	32.5	1.53"	5.5"
APR	57.1	35.6	46.4	3.05"	2.5"
MAY	70.2	47.3	58.7	4.10"	0.0"
JUN	79.2	56.9	68.1	4.06"	0.0"
JUL	82.0	60.6	71.3	4.48"	0.0"
AUG	79.9	58.2	69.0	4.38"	0.0"
SEP	72.6	49.4	61.0	3.34"	0.0"
OCT	59.9	38.1	49.0	2.23"	0.3"
NOV	40.9	24.8	32.8	1.84"	4.7"
DEC	26.5	10.7	18.6	0.99"	10.2"
Year	55.0	35.0	45.0	31.41"	41.1"

Note: Climatological data is from the Austin Waste Water Treatment plant or KAUS Radio, which starts in 1938. Some data is used from Grand Meadow, MN with data that begins in 1887.

Miscellaneous facts:

- Warmest year on record – 1987 (51.2°F)
- Warmest month on record – July 1986 and July 1955 (76.4°F)
- Warmest day on record – July 24, 1940 (102°F)
- Greatest number of days with 90°F or warmer – 1988 (43 times)

- Coldest year on record – 1996 (40.7°F)
- Coldest month on record – January 1979 (+0.5°F)
- Coldest day on record – January 15, 1963 (-42°F)
- Greatest number of days at 0°F or colder – 1978 (56 times)

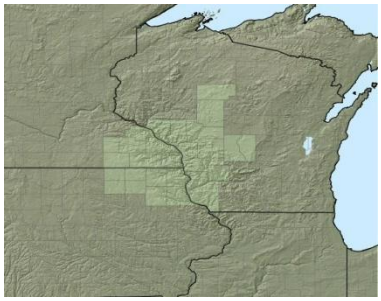


- Wettest year on record – 1993 (46.01")
- Wettest month on record – September 1965 (11.32")
- Wettest day on record – August 29, 1947 (4.55")
- Driest year on record – 1958 (18.32")
- Driest month on record – Numerous (0.00")

- Highest seasonal snowfall on record – 1961/62 (76.2")
- Highest monthly snowfall on record – December 2000 (36.5")
- Highest one-day snowfall on record – March 19, 2005 (16.0")
- Least seasonal snowfall on record – 1986/87 (17.0")

NOAA/National Weather Service Support and Weather Monitoring

NOAA's National Weather Service (NWS) forecast office at La Crosse, WI serves Mower County with weather information and support on a continuous basis. Operating 24 hours a day, a staff of 23 issues routine and non-routine informational products for the area, including all watches, warnings, and advisories related to natural hazards. Doppler radar (WSR-88D) is co-located with the La Crosse NWS office and covers the region.



NWS La Crosse has a web site at: www.weather.gov/lacrosse

Normal communication during hazardous weather scenarios is via telephone and VHF Radio.

NOAA Weather Radio coverage in Mower County includes:
- WXK41 (Rochester) on 162.475 MHz
- KXI68 (St.Ansgar) on 162.450 MHz

Storm spotter groups consist mainly of amateur radio operators and volunteer fire department personnel. Law enforcement and the general public also assist. Spotter training is held every other year with an average attendance in the past 5 years of 96.

There are a variety of weather monitoring sources in Mower County, including:

Automated weather station(s):
- Austin Mun. Airport (KAUM)

River Gauge(s):
- Cedar River @ Lansing
- Cedar River @ Austin WWTF
- Cedar River @ Austin 3S
- Dobbins Creek @ Austin
- Turtle Creek @ Austin

Cooperative Observers
- Austin 2S
- Austin Waste Water Treatment Plant
- Grand Meadow

In addition, numerous volunteer reports from around the county are received at the La Crosse NWS office including rainfall, snowfall, and temperatures, on a routine basis.

Resources

National Weather Service – La Crosse	www.weather.gov/lacrosse
NWS La Crosse Tornado Database	www.weather.gov/lacrosse/?n=tornadomain
NWS La Crosse River Monitoring	http://www.crh.noaa.gov/ahps2/index.php?wfo=arx
NWS La Crosse Climate	www.weather.gov/climate/index.php?wfo=arx
NWS La Crosse Drought information	www.weather.gov/lacrosse/?n=drought
NWS La Crosse Storm Summaries	www.weather.gov/lacrosse/?n=events
NWS La Crosse NOAA Weather Radio page	www.weather.gov/lacrosse/?n=nwr
NWS La Crosse Severe Weather Climatology	www.weather.gov/lacrosse/svr_climate.php
NWS Storm Prediction Center	http://www.spc.noaa.gov/
SPC Online Severe Weather Climatology	http://www.spc.nssl.noaa.gov/climo/online/grids/ http://www.spc.noaa.gov/climo/online/rda/ARX.html

Contact information: Todd Shea
Warning Coordination Meteorologist
NWS La Crosse
todd.shea@noaa.gov

Last Updated: November 2010